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AUTHOR Allison, Desmond; And Others
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ABSTRACT

A recent study proposed a rational for investigating the effects of mediating tasks upon a summary writing activity for tertiary-level students using English as an educational medium. The tasks in this study involved a group discussion or a reading comprehension exercise, with a third condition providing for immediate access to the text and summary instruction with no mediating activity. A subsequent comparative analysis of the content of summaries written by students under these three conditions revealed substantial difference on the selection and weighting of summary topics according to task conditions. Current comparisons focused on topic selection and relative prominence and on lexical density as a measure of the texture of the spoken and written discourse by self-report questionnaires given to 80, first-year economic students at the University of Hong Kong. Findings suggest interdependence between reading input and written output. It is suggested that student enthusiasm for the task adversely affected the written outcome in that interests were not perceived by the independent markers as being particularly salient to the text and the summary task. Appendixes present the text and student questionnaire used. (Contains 20 references.) (NAV)

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Processes and Their Products: A Comparison of Task Sequences and Outcomes In EAP Writing Classes.

Desmond Allison, Vivien Berry And Jo Lewkowicz[1]
The English Centre, University of Hong Kong

Abstract

A recent study by the authors has proposed a rationale for investigating the effects of mediating tasks upon a summary writing activity for tertiary-level students using English as an educational medium. The tasks in the study involved a group discussion or a reading comprehension exercise, with a third condition providing for immediate access to the text and summary instructions with no mediating activity. A subsequent comparative analysis of the content of summaries written by students under these three conditions has revealed substantial differences in the selection and weighting of summary topics according to task conditions.

The authors now undertake comparative studies of students' performance during the group discussions or on the reading comprehension exercise (the two mediating activities) and on their final written summaries. These comparisons focus on topic selection and relative prominence, and on lexical density as a measure of the texture of the spoken and written discourses. Students' own perceptions of the cognitive or affective impact of mediating tasks are also explored through self-report questionnaires completed at the time. Implications drawn for teaching and research include the importance of evaluating performance outcomes in relation to a number of specified goals and sets of criteria before assessing them as evidence of possible success or failure in terms of classroom language learning.

Introduction

The research presented in this paper forms part of an applied linguistic investigation into the nature and effects of tasks that 'mediate' between written texts and student readers. An understanding of how mediating tasks can affect processing and subsequent written outcomes is needed if teachers are to select or design task sequences in principled ways that take account of how class activities are likely to contribute towards language activation and learning (see, e.g., Breen, 1987; Brindley, 1987; Crookes and Gass, 1993; Long, 1990; Nunan, 1989; Skehan, 1993; Stubbs, 1987). The present research is specifically concerned with the content of summaries written by students in advanced English language classes under three different task sequence conditions, involving oral discussions, a reading comprehension exercise, or no mediating task between initial reading of a source text and writing a summary of that text. A full rationale for this investigation, and for the choice of summary writing as a final task, appears in Allison, Berry and Lewkowicz (1994); a forthcoming paper by the same authors gives a detailed account of the selection and weighting of topics in students' written summaries.

[1] Dr Desmond Allison was acting director and academic co-ordinator of the English Centre at the University of Hong Kong until his departure for Singapore in 1994. He is currently a Senior Lecturer at the Department of English at the National University of Singapore. His main research interests are in the area of second language reading comprehension.

Vivien Berry is a lecturer at the English Centre of the University of Hong Kong. She has wide experience of teaching English as a second language in various parts of the world. Her current research interests centre on the field of testing and evaluation and include the effect of personality on students' performance in oral tasks.

Jo Lewkowicz is a lecturer at the English Centre of the University of Hong Kong, where she was responsible for developing courses in the area of EAP for economics students. She is currently engaged in a major research project aimed at addressing the needs of post-graduate students in Hong Kong in the area of academic writing.

In the present paper, which for ease of reference includes a brief summary of the form and previous findings of the investigation, the authors concentrate on three issues:

- how far students' topic preferences during the oral group discussions or on the reading comprehension exercise (the two mediating activities) correspond to the topic selections and weightings observed in their final written summaries;
- whether differences in lexico-grammatical exponence across the three task conditions, the source text and the transcribed group discussions are of a form and magnitude that will affect overall estimates of lexical density;
- how students perceived the cognitive or affective impact of the mediating tasks, as inferred from their responses to self-report questionnaires completed at the time.

Implications for teaching and research include the importance of evaluating performance outcomes in relation to a number of specified goals and sets of criteria before assessing them as evidence of possible success or failure in terms of classroom language learning.

Outline of the investigation

Eighty first year economics students at the University of Hong Kong, all taking a range of subjects in the social sciences, were pseudo-randomly assigned for the purposes of this study to one of three treatments as follows:

Table 1: Mediating tasks undertaken by each group.

Groups (n = 80)	Input	Mediating task	Outcome
Grp.1 (n=28)	reading text	oral discussions	written summary
Grp.2 (n=26)	reading text	reading exercises	written summary
Grp.3 (n=26) (control group)	reading text	none	written summary

Groups did not differ significantly on an independent measure of language proficiency (for a full description of the original study, see Allison, Berry and Lewkowicz, 1994).

Each treatment group was given the same reading text, entitled "*Is there a gene for genius*?" (McCrone, 1993: see Appendix 1). Earlier trialling of the materials used in the study had confirmed that the text was of appropriate reading difficulty level, and the topic of the text was of interest to the target population. After reading the text, students in Group 1 discussed it in small groups before writing their summaries (the discussions were recorded); students assigned to Group 2 completed a series of tailor-made reading exercises, designed to assist comprehension, before writing (Appendix 2 has details of this task); students in Group 3, the control group, were simply asked to read the text and summarise it in writing. All three groups were given a continuous session of 80 minutes to complete the set activities. This was judged appropriate on the basis of a pilot study conducted with a comparable group of students. For groups 1 and 2 the time was divided into 20 minutes of reading time, 20 minutes on the mediating task and 40 minutes for writing the summary. Group 3 students were given the full 80 minutes to use as they considered most appropriate. This seemed fitting, as one effect of a mediating task is to take away time that learners might otherwise have been able to give to a final writing task, but the resulting difference in length of writing time should be remembered when comparisons involving this group are made.

The final task read as follows:

On the paper provided,

* *summarise the article*

* *evaluate the two main viewpoints developed in the article*

You may use the text and your notes (if any) to help you complete this task.

The last comment only was varied for Group 2 in light of their task, and read:

You may use the text and the reading questions to help you complete this task.

Both the text and any other written materials were therefore retained while students wrote their summaries.

Analysis of variance (Norušis, 1992) indicated that there were no statistically significant differences in the overall ratings of the summaries across the three groups, with the observed trend ($p=.08$) being control > reading > oral (ranking in order of superiority). There were, however, significant differences ($p<.05$) across the groups in the mean length of the summaries, the degree of text dependence/independence of the summaries and the number of relevant points included in the summaries. It was found that the control group with no mediating task wrote significantly longer summaries, but these were more dependent on the original text (text-dependence being determined by the number of t-units which were exact or near copies of the original text). In contrast, the oral group appeared better able to use their own words in their summaries, i.e. their summaries were less text-dependent, but the number of points they targeted for their summaries was significantly lower than for either of the other groups. These results indicated that there were differences which appeared to arise from the different treatment of the groups and which warranted further investigation. A content analysis in terms of topic selection, sequence and weighting was consequently undertaken for the source text itself and for the 80 text summaries.

The topical and functional organisation of the source text can be presented in terms of four sections (A-D below), two of which can be further divided according to subtopics (B1-B3 and C1-C4). The researchers also identified idea units that they considered relevant and reasonably likely to occur in summaries of the text. The list of 44 "targeted points" for the content analysis of students' summaries appears in Appendix 3. It is not suggested that a "good" summary would need to include all these targeted points; nor does the list exhaust the information and ideas that might be drawn from the source text. The set of 44 points is nonetheless taken to constitute a sufficiently comprehensive content coverage for the purposes of the analysis.

The identified sections and subsections were:

A: Introduction to the issue (175 words; targeted points 1-5);

B: Genetic side of the debate (585 words; targeted points 6-23):
- B1: Report that a gene directly affecting intelligence had probably been identified in research by Plomin et al. (targeted points 6-13);
- B2: Evidence that outstanding mathematical ability in boys is linked to extreme lateralisation (which is hormonally rather than environmentally governed), from research by Benbow et al. (targeted points 14-22);
- B3: These findings (B1 and B2) tend to suggest that genius is largely innate (targeted point 23).

C: Environmental side of the debate (800 words; targeted points 24-39):
- C1: But there are also environmental factors at work (targeted point 24);
- C2: Infant "prodigies" also prove to have had special parents/ guardians, whose role during early years is emphasised (targeted points 25-28);
- C3: Importance of parental styles (Csiko) for child's development (targeted points 29-35);
- C4: Importance of conversation with adults for child's development (targeted points 36-39).

D: Summary of issues (176 words; targeted points 40-44).

Content analysis of the 80 written summaries in terms of topics and targeted points examined the selection, sequencing and weighting of information and ideas from the source text. The detailed findings presented in Allison, Berry and Lewkowicz (forthcoming) showed that text coverage was more comprehensive in the summaries of Groups 2 and 3 than in Group 1. The selection and elaboration of topics in Group 1 was more strongly weighted towards a consideration of environmental factors (section C in the source text outline above) and was particularly low on treatment of the reports that a gene affecting intelligence may have been discovered (section B1). This outcome in terms of weighting was not explicable in terms of time restrictions for the summary writing, as these were common to Groups 1 and 2 (although the greater overall length of Group 3 summaries can be accounted for in terms of time available for writing).

Aims and objectives of the current research.

Within the framework of this research project, this paper reports in detail on the author's investigation of the following features:

- the relationship between the points covered in the small-group discussions and those given prominence in the respective participants' written summaries;
- the relationship between the answers to the reading comprehension questions and the points given prominence in the respective students' written summaries;
- the lexical density of the summaries across the 3 groups.
- students' affective reactions to the tasks, as reported in a short questionnaire.

Small-group discussions and Group 1 written summaries.

For Group 1 (oral mediating task) the discussions by each sub-group were recorded. These were later transcribed and the points covered in them were analysed. Table 2a shows the results of t-tests computed to show whether there were any differences in the mean amounts of time spent discussing points in sections B (genetic side of the debate) and C (environmental side). Attention was paid both to overall length (mean number of words) and to topical content (targeted points identified in the content analysis).

Table 2a: Comparison of mean number of words used to discuss points in Sections B and C in sub-group discussions.

Section	Count	Mean	S.D.	df	t-value.	2-tail [a]
B	6	172.167	120.229	5	-3.08	.028
C	6	505.167	190.386			

Table 2b: Targeted points covered in discussions by each of the oral sub-groups.

Oral Sub-Groups	Section B (6-23) (genetic points)	Section C (24-39) (environmental points)
I	16, 17, 22	32, 33
II	-	27, 28, 32, 34
III	15, 16, 17	25, 30, 34
IV	15, 17	27, 30, 34, 36
V	15	27, 28, 30, 31
VI	15, 22	27, 28, 34, 36, 38

In Allison, Berry and Lewkowicz (forthcoming), evidence is presented which suggests that reporting research into the genetic basis of intelligence would probably be difficult as it might be beyond many students' prior knowledge of the topic. Examination of the targeted points covered in the oral discussions lends considerable support to this intuition (Table 2b). Of the Section B (genetic) points discussed, none of the six sub-groups (I to VI) made any mention at all of how genes affect intelligence or of the claim that genius is largely innate. However, with the exception of sub-group II (who concentrated solely on environmental issues), all groups discussed the evidence that boys have greater mathematical ability than girls. This is, of course, a topic which is very familiar to these students, given the cultural context within which they operate. That is not to say that there was unanimous agreement that boys are more gifted at mathematics than girls. In fact, in one group (sub-group III), there was an extremely heated discussion bordering on an argument between the male supporters of the suggestion and the female detractors. The point is simply that this is a familiar topic and therefore one which can be easily discussed, to the possible detriment of the other points made in the original reading text.

Contexts which are easily related to were also exploited by all sub-groups when discussing environmental points. With the exception of C1 (point 24), each of the other subsections of C were given approximately equal discussion time. This provides further evidence that discussion will more easily take place about familiar topics. It will be noted that point 24 mentions a conference. The fact that the whole text is about research reported at the conference seems to have been considered entirely irrelevant by the discussants who immediately latched onto items such as 27 which considers childhood stimulation by parents and item 28 which exemplifies this by mentioning prodigies such as Gauss, Einstein, Picasso and Mozart. The uptake on item 28 is particularly interesting since it reflects the type of early childhood stimulation by parents in the local environment. There was not a single mention in the discussions of any of the prodigies except Mozart; however in this context all groups (including sub-group III whose dominating topic was mathematics) expanded on the theme of parental stimulation and encouragement to play the piano!

Evidence of the degree of influence of topics discussed on points mentioned in the summary is particularly marked when looking at the summaries from sub-group III. Despite the disagreement within the group as to boys' superiority at mathematics, four of the five members of the group wrote about Benbow's findings in their summaries, mentioning in particular that there are more mathematically gifted boys than girls. The fifth summary mentions only two of the points which were actually targeted by the researchers (points 27 and 28). However the major uptake in this summary is not on other environmental features but on Gauss as being a great mathematician from the past. The student then demonstrates the lasting effect of discussion on writing by relating the parental influence on Gauss at an early age to an extraordinary analogy about fertiliser and barren soil, the suggestion being that fertiliser equals parental encouragement to exploit whatever potential is present. (Not surprisingly, this analogy is restricted to the one summary only.) What is extraordinary about it, however, is that in the lesson immediately preceding the experiment (held one week earlier), the same group had discussed a futuristic science text about using robot farmers to spray fertiliser on fields in Japan!

Less interesting, but noteworthy nevertheless, is another summary which does not include any points from Section B. There is also no discussion or even acknowledgement that the text is about a possible genetic basis of intelligence. The words *gene, genetic, innate*, etc. are not mentioned once, whereas *environment* or *environmental* occurs six times in the total of twelve sentences. This student was in the only discussion sub-group (sub-group II) which made no mention of any Section B points.

Otherwise, all students' summaries included the points mentioned in the discussions but also included many more which were derived from the original source text. The effect of this will be returned to in 3.3 when lexical density of summaries is discussed.

Reading comprehension exercise and Group 2 summaries.

For Group 2 (written mediating task) the responses to the comprehension questions were checked, and points raised in the questions were matched with those targeted in the written summaries for the group. One question was whether scores on the reading comprehension exercise (calculated only for the purposes of this study, as these were not assessment grades) would correlate highly with scores for Group 2 subjects on the written summaries. A high correlation would not necessarily be expected, not least as many reading exercise items did not discriminate highly among subjects (the aim was to guide reading rather than to test it, and high facility values were found for many items); also, some of the "incorrect" responses on the reading exercise involved relevant material from the text that had not been correctly matched to an exercise item, but that would be appropriate for inclusion in a summary. A second, more interesting question was whether topic coverage in the reading exercise was discernibly related to topic prominence in Group 2 summaries by comparison with Group 1 in particular (same summary writing time but different mediating task) and with Group 3 (more writing time and no mediating task).

A summary of the responses to the reading comprehension exercise appears as Table 3. (Appendix 2 gives the complete item wording.) Notice the very high success rates for the questions about the names of new research techniques (2b and 3a), the provisional nature of Plomin's discovery of a gene that determines intelligence (2a), the inborn nature of lateralisation (3ciii), and the role of cultural factors in increasing or decreasing a disparity in mathematical abilities across the sexes (3civ).

Table 3: Summary of responses to reading exercises (n=26).

Exercise item #	Correct	Incorrect		Omit
		(Relevant)	(Other)	
1	24	1	1	0
2a	25	0	1	0
2b	25	1	0	0
3a	23	2	0	1
3b	12	12	0	2
3ci	18	7	1	0
3cii	16	8	1	0
3ciii	23	1	2	0
3civ	23	n.a.	3	0
3cv	20	3	1	2
4a	17	n.a.	8	1
4b	19	n.a.	4	3
4c	14	5	1	6
5	19	0	0	7
6a	20	n.a.	2	4
6b	9	11	0	6
7	17	2	2	5

(n.a. = *not applicable* since items were either right or wrong)

Most other results are quite high; exceptions have to do with precise focus on the question. For 3b, 12 "relevant" responses gave information that related to the topic but that was not drawn from the particular line numbers for this question - and that had thus already moved further on in terms of the argument. For 3cii, some answers were incomplete or imprecise; for this particular item, answers listed as "incorrect but relevant" actually counted as half-marks. Any difficulty with 4a is consistent with other work suggesting that a writer's disagreement with reported views can prove problematic for ...ent readers (Allison and Ip, 1991). One other feature to note is that omitted items became more frequent towards the end. (Four students did not complete any question after 4b and a fifth responded intermittently in this final stage. Two of these five students had summary scores in the top quartile.)

Returning to our two questions for this stage of the analysis, we can first note that the correlation between scores on the reading exercise and ratings for the written summaries was .217 (n.s.). We must repeat that the reading exercise was designed to help students understand the text and was not intended to discriminate between them for purposes of assessment.

Our second question was if and when topic coverage in the reading exercise was matched by unusual prominence of topics in the summaries. A comparison of targeted items occurring in summaries across the three conditions revealed a number of differences between frequencies of occurrence in Group 1 (oral) and Group 2 (reading) summaries. From earlier findings, Group 1 was known to have included significantly fewer targeted points in all than had Group 2 (and also, less interestingly, Group 3 who had more time in which to write). It was decided to examine only the differences in the frequency with which targeted points were included by Groups 1 and 2, reflecting the two specified mediating task conditions rather than the effect of additional writing time, and to select (somewhat arbitrarily) those items on which the observed difference between Groups 1 and 2 was at least 6 targeted points. The results are presented in Table 4.

Table 4: Distribution of occurrences of targeted items in summaries (for items differing substantially between Groups 1 and 2).

Item	Item content	Grp.1	Grp.2	Chi^2 (1 df)	Sig.
3	nature versus nurture	10	17	4.659	.031
10	new gene-mapping techniques	2	15	17.618	.000
14	computerised brain-scanner	6	17	10.456	.001
16	process spatial information	13	19	3.892	.049
23	findings so far, largely innate	5	11	3.794	.051
24	role of environmental factors	19	13	1.748	.186
37	way in which a parent talks	2	9	6.157	.013
38	open and creative thinking style	11	17	3.610	.057

(See Appendix 3 for full item content).

It can be seen that seven of the eight instances listed involve greater frequency of occurrence of a targeted point in Group 2 than in Group 1 (despite the slightly lower number of scripts in Group 2). Six of these seven targeted points, excluding point 23, can be linked to reading comprehension exercise items (specifically, in sequence, to 1, 2b, 3a, 3c, and 6b, this last item corresponding to both targeted points 37 and 38). Targeted item 10, for example, was "Plomin used new gene mapping techniques"; reading comprehension item 2b was: "What new kind of research technique has Plomin's team used?" It appears that focusing, in the exercise, on this specific point of information has also induced more frequent inclusion of this point in summaries written by students who completed the reading exercise. The seventh point, item 23, was a generalisation in the original text that was not very widely taken up in students' summaries: the point may have become rather more salient for Group 2 students, as the work of these two groups of researchers is highlighted in the reading exercise (questions 2 and 3). Item 24, the only one in the list mentioned more frequently by Group 1 students, is interesting in light of other evidence of a greater focus on the importance of environmental factors in Group 1 discussions and writing.

Lexical and grammatical exponence: lexical density across the three conditions

Given the differences that had been detected in the selection and emphasis of points drawn from the source text in summaries written under the three different conditions, it seemed plausible that other differences might be found in the lexical and grammatical realisations of summaries across the three groups in our study. In particular, it seemed worth exploring the possibility that features of students' more text-independent writing might prove less typical of formal written English than was the source text itself, and this would lead to observable differences in texture when summaries were compared. From preliminary analysis (Allison, Berry and Lewkowicz, 1994) it had emerged that Group

1 (oral group) had included the highest proportion of text-independent t-units (68%), with Group 2 (reading group) slightly lower (63%) and Group 3 (control group) much lower still (38%). A measure of the grammaticality of students' written summaries, namely the relative proportions of correct to incorrect t-units had shown no significant differences across groups, although Group 3 t-units were observed to be rather longer than average and might thus tend to be more complex syntactically.

A practical problem for the researchers was to find a robust measure that could reveal differences in linguistic complexity (itself a complex notion) across the three conditions within the time frame available for this stage of the research. The tagging of each sentence in 80 summaries in terms of a syntactic analysis might have proved revealing, not least as our earlier analysis gives no further information as to the nature and extent of errors in the incorrect t-units that had been identified in the data. Such an analysis was beyond our immediate scope, yet we still sought something that could offer more than an occasional commentary on particular items. We also needed a measure that was more intrinsically linked to patterns of lexico-grammatical choice than is the case for crude predictor variables of mean word length and sentence length so often used to estimate "readability" (see Davison and Green, 1988 for critiques of readability formulae and their misuses).

Following Halliday (1989: 63-67), and also Stubbs (1986), we decided to investigate the parameter of ***lexical density***, taking lexical density to be the relative proportion of lexical to grammatical words in a text or corpus (compare Halliday, 1989: 64). Although Halliday goes on to offer "a more revealing account of lexical density" (1989: 65) which also takes into consideration the number of clauses in a text or corpus, we decided to limit our study on this occasion to the number of lexical tokens as a proportion of the total number of running words in the text or the corpus of texts being examined (the source text and each of the three sets of summaries). Besides accepting constraints of time, we took this decision in the knowledge that the average number of t-units (and hence of main clauses) was not significantly different across the three conditions in our study. The number of lexical items as a proportion of all words in a text (spoken or written) is a measure which Halliday puts forward as "a first approximation to a measure of lexical density" (1989: 64). This measure has been conveniently operationalised by Stubbs (1986), who supplies a list of grammatical words and ambiguous words to be excluded for this purpose from the total number of word tokens in a text. This list is reproduced as Appendix 4.

This measure of lexical density is characteristically related to more specific differences in lexical and grammatical exponence. A relatively high lexical density is associated with frequent occurrence of complex nominal groups, and is characteristic of formal written texts, while a relatively low lexical density is more typical of spoken language (which might also be associated with greater clausal complexity). The researchers were uncertain what effect the process of summary writing, under any or all of the three different conditions, might have on lexical density. Two competing views were that (a) lack of mastery of formal writing might lower the lexical density of students' summary writing, making texts more like spoken English (perhaps especially in Group 1) and hence less lexically dense, or (b) the process of summarising a text, in all groups, would entail the extraction of content "chunks" that would then be recombined as concisely as possible, leading to summary texts that were more lexically dense. We have already noted that all groups drew quite extensively on the source text itself in the course of their summaries. While we made no formal hypotheses, we were interested to find out whether the summary corpora differed in lexical density (i) from the source text and (ii) from one another.

The easiest way to proceed was to search each set of summaries for the occurrence of all grammatical words in English and to subtract these tokens from the total number of word tokens in the respective texts. The remainder would thus be the total of lexical tokens in the texts. The lists of grammatical and ambiguous words (sometimes grammatical and sometimes lexical) as indicated above came from Stubbs (1986:36-37). The texts were concordanced using MicroConcord (Scott and Johns, 1993). Stubbs's work in the mid-1980s used a different computer program to obtain the same information.

As an initial estimate (a step that is not proposed by Stubbs), the researchers elected to subtract both the grammatical and the ambiguous sets of words from the total number of words. This procedure obviously leads to an underestimate of lexical density, because some of the ambiguous words will be

lexical rather than grammatical, and ought not to be subtracted from the total. Provided, however, that its limitations are understood, the procedure permits exploratory comparison. The results thus obtained are summarised in Table 5. (**N.B.** Lexical density = [remaining words / total words] x [100]. For word lists, please refer to Appendix 4.)

Table 5. Preliminary estimations of lexical density of three sets of summaries (3 corpora) written under different mediating task conditions plus source text.

Source	Grammatical words	Ambiguous words	Total words	Remaining words	Estimated lexical density
Text	801	118	1736	817	47%
Grp 1	4023	699	8662	3940	46%
Grp.2	3881	634	8465	3950	47%
Grp.3	4421	739	9991	4831	48%

As can be seen from Table 5, none of the summary corpora differed markedly in lexical density either from the source text or from each other. What is striking is that the values obtained for both the source text and the corpora are substantially lower than might be expected of written texts. In fact they correspond much more closely to the values reported by Stubbs (1986:41) for various spoken databases, i.e. 44% - 56%. Although this was not entirely unexpected for the students' summaries, it had not been anticipated for the source text. It should be remembered that the method chosen to estimate the lexical density of the source text, the 3 student corpora and the group discussions possibly presents an underestimate of actual lexical density since ambiguous words have in all instances been classed as grammatical when some of them may, in fact, have been lexical. However, as Halliday points out: "..... it does not matter exactly where we draw the line provided we do it consistently." (1989:63). A recalculation that counted all the ambiguous words as lexical (hence overestimating the lexical density) would still yield values below 55% and thus within the spoken range already noted. One possible explanation for the low values of lexical density obtained lies in the journalistic nature of the text, which aimed to present complex research findings to an extremely diverse audience, and was thus written in a style which is less condensed than would generally be found in specialist written texts on this subject. This does not in any way detract from our earlier contention that this text was appropriate both to the task and the students' ability levels and interests - a belief that is supported by student responses to the affective questionnaire (see Appendix 5) which will be discussed in the final section of this paper. Nevertheless, the values obtained in this study do not support the expectation that students' written summaries might be lower in lexical density than the original text; they do, however, lend some credence to the notion that they might be closer to spoken or informally written English.

An initially surprising finding is that the lexical density of the transcribed sub-group discussions, at 52%, is in fact higher than that of the source text and the written summaries. A possible explanation of this may be found in Halliday's (1989:81) account of the representation of phenomena in written language as *products* (therefore lexical nouns) and in spoken language as *processes* (therefore grammatical verbs). Halliday's explanation is, of course, provided to support his findings, which concur with those of Stubbs and also of Ure (1971), of greater lexical density in *written* text. However, in examining the examples he gives as illustration (p. 81 - *had ended up, had visited, had been, has improved*, etc.), it becomes immediately obvious that the degree of syntactic sophistication he is referring to is beyond the ability levels of the majority of students who took part in this study (see Newbrook, 1989 for a highly personalised but nevertheless perceptive explanation of the cause of many Hong Kong Chinese students' grammatical errors in written English). Thus the somewhat primitive degree of grammatical exponence present in the quite wide-ranging student discussions may account for the higher value observed for lexical density under these conditions. Clearly, interpretations of findings in the area of lexical density will require particular caution when evidence from second-language learners is being considered, and the informative potential of lexical density estimates should not be too readily generalised to such texts and contexts.

Students' affective reactions to the mediating tasks.

Students' reactions to both reading and discussion mediating tasks were generally very positive. At the end of the experiment students were given a short questionnaire to complete. This took the form of six statements requiring responses of "*agree*", "*disagree*" or "*no opinion*". The seventh and final statement consisted of an open invitation to comment on the task just completed. As is often the case with students from this cultural background there were very few comments, the only really substantial one relating to the oral mediating task and being to the effect that: "...if partners don't have any stands or opinions to offer on the issue under discussion, then the discussion becomes dull and meaningless." With regard to the rest of the statements, the responses across the task groups were virtually identical, the vast majority of students believing that whichever task they had completed, it had helped in both their understanding of the text and their subsequent summaries of it.

The notable exception to this was in the response to the third statement which was: "*The text was worth thinking about.*" Here the distribution of students' responses differed dramatically (and statistically significantly: - $\chi^2 = 10.234$: - $p = <.01$). Expressed as a percentage ratio of students in agreement in each task group, Group 1 (the oral group) were 89:11 in agreement, Group 2 (the reading group) were 73:27 and Group 3 (the control group) were 50:50 ("*disagree* "and "*no opinion*" were taken together as not constituting actual agreement). There are, of course, a number of possible explanations for this, predominant among them being the observation that the degree of interest in the text was in inverse proportion to the amount of time exposed to it (on the assumption that the reading group spent more of their mediating task time than the oral group in actually referring to the source text). This is particularly disturbing in the light of the, admittedly not significant, trend for summaries from the three groups to be rated in direct proportion to the degree of time exposure available and inversely to the degree of interest expressed (i.e. control > reading > oral in terms of scores awarded, but the reverse direction on declared interest).

Implications for teaching

In a study such as this, it is clear that for the findings to have more than peripheral value, they should be of practical, rather than merely theoretical, interest. Dealing as we are with the relationship between specific learning tasks in the language learning classroom and observable written outcomes, it would be fairly pointless simply to present statistically significant results and expect them to be greeted with anything more than perhaps a polite acknowledgement. It seems unlikely that the classroom teacher will be more than marginally interested in the magnitude of the correlation coefficient between, for example, scores obtained on the reading questions and scores given for the summary writing. It does, however, seem likely that most teachers will be interested in discovering a) students' perceptions of the tasks as mediators between text and summary and b) the extent to which the tasks themselves could actually be deemed to be facilitating.

In earlier sections of the paper we presented evidence which showed that responses to some of the reading questions had a direct impact on points mentioned in the summary. This is not a purely mechanistic feature of the exercise since not all questions received the same amount of attention in the summaries. It is also possible that although the reading exercises were perceived by students as facilitating both their understanding of the text and their subsequent summaries of it, what in fact happened was that the reading questions slightly skewed the targeted points that were picked up and expanded on in the summaries, thus to some extent lowering the scores obtained by this group. If the suggestion of interdependence between reading input and written output can be confirmed with further empirical evidence, it certainly has implications not only for teaching but also for language test design. A similar point is also noteworthy when comparing Group 1 (oral mediating task) students' responses. It could be argued that their enthusiasm for the task adversely affected the written outcome in that their interests were not perceived by the independent markers as being particularly salient to the text and therefore to the summary task.

Perhaps at this stage it would be appropriate to summarise what, with hindsight, can clearly be seen as constraints (and limitations) of the study. First, it can be argued that the nature of the source

text, with its journalistic bias, did not conform linguistically to expectations of texts in this subject area thus creating artificial limitations on the syntactic sophistication of summaries which could be expected of it. Second, it has been shown that within an academic context, imagination, i.e. deviance from the text, is not especially rewarded and that longer summaries, which include more immediately observable points from the source text, are rewarded disproportionately. It may also be that oral mediating tasks are not especially suited to traditional expectations in "academia"! They could, however, be of immense value when more personalised, imaginative narrative accounts are required. A critically important implication is that an assessment of task outcomes, such as written summaries, in accordance with one set of criteria will not be sufficient to determine the success of a classroom activity in terms of the learning it is likely to have generated.

A final comment, but one of fundamental interest (and one that is directly related to the previous comments on the reception of ideas from the group who had the oral mediating task), is related to the notion of whether the exploration of one's own experience, "narrative knowledge", is possibly an undervalued form of knowledge (Hymes and Cazden, 1980; Hynds and Rubin, 1990). To extend this beyond the immediate context of English language learning, it may be appropriate to ask whether students' knowledge is, in fact, undervalued throughout the modern academic curriculum. The implications of any attempt to provide an answer to this question undoubtedly transcend the scope of this enquiry.

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Appendix 1 **Text used in the study**

Is there a gene for genius?

DR HOWARD GARDNER of Harvard University believes that geniuses are largely made. He has banned television from his home because he fears it might rot the minds of his family. He makes time everyday to listen to his seven-year-old, Benjamin, play the piano - even if it is no more than a few minutes during a transatlantic phone call while he is away at a conference.

Dr. Sandra Scarr of Virginia University, president of the Society for Research in Child Development, believes geniuses are largely born. She says parents should not worry too much about whether to take their kids to a ball game or to a museum. Talent will out.

It seems psychologists are as divided as ever over the issue of nature versus nurture. This may, however, be about to change. A conference organised earlier this year by the Ciba Foundation brought to London some of the biggest names from both sides of the debate. Startling results from unpublished work were revealed - and the beginning of a consensus could be discerned.

The most exciting results came from those working on the biology of individual differences. Dr Robert Plomin of Penn State University, working with a team from Cardiff University, hopes to announce within the next few months that he has tracked down one of the genes that plays a part in determining intelligence. An unnamed gene has been identified but the results have yet to be confirmed.

At present, it is believed that genes account for at least half of what researchers call "g" - the general cognitive ability that IQ tests are supposed to measure -while environmental influences account for the other half. But so far the evidence for a genetic component has been purely statistical, being inferred from comparisons of twins and other such hereditary studies. Plomin's method makes use of new gene mapping techniques and promises to provide direct evidence of the role that genes play.

Plomin stresses that the discovery of a first gene does not mean the riddle of intelligence has been solved. A single gene will code for only one of the many neurotransmitters and cell proteins that are the building blocks of the brain. This means that hundreds, if not thousands of genes must be involved in intelligence. The identification of even one gene does, however, have immense implications for the nature/nurture debate.

Another innovation, the computerised brain scanner, has led to a second discovery by those seeking the biological component of mental abilities. Professor Camilla Benbow of Iowa State University is head of a long-term study of the mathematically gifted. For many years she has been puzzled as to why so many of the children in her study should be boys - at the top level, boys outnumber girls by 13 to one. In a soon-to-be-published paper, Benbow reveals that the gifted boys' brains appear to process spatial information in a very different way from those of average boys and even of gifted girls.

The children in the study were scanned while being presented with a simple visual puzzle. The boys of average ability and the gifted girls showed strong activity on both sides of their brains as they thought about the puzzle. However, the gifted boys responded very differently. There was a sudden drop in activity in their left hemispheres - the side of the brain most involved in language - and an exaggerated reaction on the right, the side strongest at spatial thinking. It seems that the brains of boys with mathematical talent operate in a way that is physically distinctive.

Benbow says she was surprised that the gifted girls should lack this pattern of response. The only explanation she has is that male brains have a tendency to become more lateralised during development; when this lateralisation is taken to an extreme, unusual spatial abilities result.

Because females do not have this tendency (lateralisation is known to be hormonally governed), girls who perform well in mathematics are doing so because of a more general mental superiority. And because statistically such all-round ability is less common, this would be the reason for there being fewer mathematically gifted girls.

Benbow is quick to add, however, that cultural expectations probably exaggerate the imbalance. In China, where girls are more likely to get encouragement in mathematics, the number of gifted boys exceeds that of gifted girls by four to one rather than the 13 to one seen in the United States.

Both Plomin's and Benbow's findings would seem to give ammunition to the argument that exceptional mental abilities are largely innate. But the Ciba conference heard equally strong evidence for the role that environmental factors play in creating genius. A theme repeatedly heard from the speakers was that special children invariably have special parents.

It is a popular myth that great prodigies - the Einsteins, Picassos and Mozarts of this world - spring up out of nowhere as if touched by a divine finger. The archetype is Carl Friedrich Gauss, born into a supposedly illiterate family of labourers, who grew up to become the father of modern mathematics.

Professor William Fowler of the Massachusetts Centre for Early Learning has attacked this myth, saying that when he looked into Gauss's

childhood, he found that Gauss's mother had been teaching him numerals at the age of two. His father had been a foreman, not a labourer, and played calculation games with him. Furthermore, Gauss had an educated uncle who taught him sophisticated maths at an early age.

It is the same story with other prodigies. Einstein's father was an electrical engineer who fascinated his son with practical demonstrations of physics. Picasso's father was an art teacher who had young Pablo copying still lifes at the age of eight. Mozart's father was a court composer who was teaching his son to sing and play almost before he could walk. "In every case, when you look into the backgrounds of great people, there is this pattern of very early stimulation by a parent or mentor figure," Fowler says.

But what sort of parental stimulation should it be? The conference heard plenty of evidence that, too often, parental pressure and attempts at "hot-housing" children result in burn-out rather than giftedness. Professor Mihaly Csiko of the University of Chicago reported on a study which identified two kinds of parental style - the supportive and the stimulating.

Supportive parents were those who would go out of their way to help their children follow their pet interests and praised whatever level of achievement resulted. Generally, such parents created a harmonious home governed by clear rules. Stimulating parents were more actively involved in what their children did, steering them towards certain fields and pushing them to work hard, often acting as a tutor.

Csiko's study followed four groups of children: one with supportive parents, one with stimulating parents, one whose parents combined both qualities and a final group who offered neither. The children were given electronic pagers; when these buzzed at random intervals during the day, they had to make a note of what they were doing and assess how happy and alert they felt.

The not too surprising result was that the children whose parents were simply supportive were happier than average but were not particularly intense in their concentration when studying or working on an interest. The children who fared best were those whose parents were both supportive and stimulating. These children showed a reasonable level of happiness and a very high level of alertness during periods of study.

Children whose parents were stimulating without being supportive were candidates for burn-out. These children did work long hours, but their alertness and happiness during study time was far below that of children in more balanced family environments.

Another crucial factor stressed at the Ciba conference is the need for parents to have proper conversations with their children. Through having the chance to talk with adults, children pick up not only language skills but also adult habits and styles of thought. One reason why prodigies such as Picasso and Einstein had a head start in life was that they had parents who demonstrated how to think about subjects like art or physics at a very early age.

Professor Fowler said a survey in Holland showed that a typical father spent just 11 seconds a day in conversation with his children. A more recent study in America produced a somewhat better result, but the fathers in question were still talking to their children for less than a minute a day.

It is not just the time spent that counts, Fowler says, but also the way in which a parent talks. A parent who brushes off a child's questions or gives dull answers will be imparting a negative, narrow-minded style of thinking. On the other hand, parents happy to take a child step by step through an argument, encouraging it to explore ideas, will foster an open and creative thinking style.

Fowler is attempting to show this experimentally with a study in which groups of parents are taught how to have constructive conversations with their toddlers. Fowler says these children have shot ahead of their peer group in language ability, intellectual ability and even social leadership skills. While the study is not yet complete, the children appear to have been given a lasting advantage.

So what is the outlook for parents who do everything right, those who manage to be both supportive and stimulating, who are good at demonstrating thinking skills to their children and successful at fostering a self-motivated approach to learning? Would such parents be guaranteed to have a gifted child?

There was general agreement at the conference that there is no denying that genuine biological differences exist between individuals; geniuses need to be lucky in both their genetic make-up and their parents. The most significant implication would seem to be that while most people are in a position to fulfil their biological potential -that is, barring serious illnesses or dietary deficiencies, they can be certain their genetic capacities will be fully developed - there can be no such certainty that they will grow up in the environment necessary for that development.

So although knowing more about the biology of genius is all very interesting, it is research into better parenting and educational techniques that will have lasting significance.

By John McCrone
The Independent on Sunday, 2/5/93
(slightly adapted)

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Appendix 2

Reading exercise used in the study

Reading exercise: Is there a gene for genius?

Introduction

The aims of this exercise are to help you explore the text, check your understanding, look at how some of the ideas are connected, and ask some critical questions.

Different students have different needs and reactions. Please be patient if you personally find some items very easy or too difficult. We will ask for your comments later.

Your teacher will tell you how much time you have. Don't spend too long on any one item! Write your answers on the exercise sheet. (N.B. space for students' responses has been deleted from this appendix.)

Exercise*

1. Vocabulary and ideas

a. What is the "nature/nurture" question? (Hint: If you are not sure what "nurture" means, then make a guess based on the text; it is obviously something contrasted with "nature"!).

b. Place the seven words or phrases in the list under one of the two columns. The first two have been placed for you.

LIST:

1. largely born	2. largely made	3. genetic component of intelligence
4. hereditary influences	5. environmental influences	
6. innate abilities	7. cultural expectations.	

"NATURE"	"NURTURE"
1	2

(* line numbers were provided for the students on their copy of the reading text rease of reference)

2. Work by Plomin and his team

a. Note down words and phrases from the text that remind us that Plomin's results are not yet final.

b. What new kind of research technique has Plomin's team used?

3. Work by Benbow and her team

a. What new research technique was used?

b. Benbow was studying mathematically gifted children. What aspect of her study was unexpected? (Paragraph 7, lines 45-55)

c. Based on the work of Benbow and her team, answer the following questions about how gifted boys' brains work. (Hint: If the word "lateralisation" troubles you, remembe: that the adjective "lateral" has to do with "sides").

(i) What information do gifted boys' brains process differently from other people ? _

(ii) What is special about their brain activity?

(iii) Is this aspect of brain activity inborn or a result of environmental factors?

(iv) Is this aspect of brain activity the only reason that fewer mathematically gifted girls than boys are found in the United States?

Answer YES or NO _____

Briefly explain your answer :

4. **Critical reading: read lines 86-116**

a. "It is a popular myth that..." (line 93). Does the writer go on to agree or disagree with the belief that he reports here? ANSWER :_____

b. Was Gauss's family illiterate?
- Answer YES or NO_____
- What one word (in lines 93-98) explains your answer?_____

c. Fowler's comments provide reasons to suppose that the environmental role of parents (or other figures) in early life is important. What is a common factor (other than just "having special parents") in the examples, he discusses (Gauss, Einstein, Picasso and Mozart)?

5. What does the use of the term "hot-housing" (line 119) tell us about the writer's attitude towards attempts by parents to make children learn and develop more rapidly?

6. a. According to Csiko's findings, which parental style or combination of styles is most beneficial for children? Circle your chosen answer.

SUPPORTIVE STIMULATING BOTH

b. What aspects of parent-child conversation are important, according to Fowler? (lines 152-181).

7. Do you think the conclusion (see final paragraph) is that of the discussions at the scientific conference, or the journalist writing the article?

Appendix 3

"Idea Units" targeted in the study

1. X believe that geniuses are largely born (that heredity matters) (X = Scarr, some scientists, etc.)
2. Y believe that geniuses are largely made (Y = Gardner, etc.)
3. (1 and 2 can be paraphrased as) The issue is (Psychologists are divided over) nature versus nurture.
4. The issue (3) was discussed at a recent conference (in London; Ciba foundation).
5. The beginnings of a consensus (reduction of difference) could be discerned.
6. Plomin has (probably) discovered a gene that plays a part in determining intelligence.
7. Plomin's results have yet to be confirmed.
8. At present, scientists etc. believe genes account for at least half of "g" (general cognitive ability; and think environmental factors/influences account for the other half/part).
9. Evidence (re 8) has so far been statistical.
10. Plomin used new gene mapping techniques.
11. Plomin's work promises to provide direct evidence of the role that genes play.
12. Many genes must be involved in intelligence.
13. Discovery of even one gene (that contributes to intelligence) has immense implications for the nature/nurture debate.
14. Benbow (et al) used the computerised brain scanner.
15. Benbow was studying the math. gifted (wanted to explain why so many math. gifted children were boys).
16. Benbow's study showed that gifted boys process spatial information differently.
17. (Math.) gifted boys' brains operate in a way that is physically distinctive.
18. (Benbow's explanation is that) male brains tend to become more lateralised during development.
19. Lateralisation is hormonally governed.
20. Extreme lateralisation (B. explains) results in unusual spatial abilities.
21. Girls who perform well in math. do so because of general mental superiority.
22. Cultural expectations can exaggerate the imbalance (bet. numbers of gifted boys and girls: + example comparing ratio of gifted boys to gifted girls in China and in America).
23. Plomin's and Benbow's findings strengthen the argument that exceptional mental abilities are largely innate.
24. The conference heard (equally strong) evidence for the role of environmental factors.

25. (One theme was that) special children invariably have special parents.

26. A popular myth is that geniuses just happen (divine finger!)

27. (Fowler maintained that) backgrounds of all great people had pattern of early stimulation by parent or mentor figure.

28. Examples included (some or all of) Gauss, Einstein, Picasso and Mozart.

29. (A relevant question is:) What sort of parental stimulation should it be?

30. Csiko identified (studied) two kinds of parental style - supportive and stimulating.

31. Supportive parents helped children follow pet interests (and praised whatever achievements resulted).

32. Stimulating parents pushed children towards preferred fields (and/or) pushed children to work hard.

33. Csiko's study compared (4) groups (of children) with different (combinations of) parental styles.

34. Children who fared best had parents who were both supportive and stimulating.

35. These (34) children were reasonably happy and very alert when studying.

36. Another crucial factor was the need for parents to have proper conversations with their children.

37. (Fowler said that not only amount of time but especially) the way in which a parent talks is important.

38. Parents who take a child step by step through an argument and encourage it to explore ideas will foster an open and creative thinking style (will encourage learning).

39. (When) parents (are taught to) have constructive conversations with their toddlers, these children do better (shoot ahead of peer group in language ability, leadership ability and social leadership skills).

40. There was general consensus that (no denying that) genuine biological differences exist.

41. Geniuses need to be lucky in both genetic make-up and parents (both genes and environmental factors are important).

42. Most people are in a position to fulfil their biological potential.

43. The most significant implication is that there is no certainty that the environment will provide necessary support as people develop.

44. Therefore (43) (it is) research into better parenting and educational techniques (that) will have (more) lasting significance.

Appendix 4

Lists of grammatical and ambiguous words listed by Michael Stubbs.

From: *Lexical Density: A Technique and Some Findings. (pp. 36-37)*

Grammatical words:

a above across after against all along alongside although amid amidst among amongst an and any anybody anything anywhere apropos as at atop because before behind below beneath beside besides between beyond both but can can't cos could couldn't dare daren't despite doesn't don't during each either every everybody everyone everywhere except few for from he he's he'll he's her hers herself him himself his how however if in inside into it it'd it's its itself many may mayn't me might mine minus much must mustn't my myself needn't neither never nevertheless no no-one nobody none nonetheless noone nor not notwithstanding of off on or ought oughtn't our ours ourselves out outside over per plus shall shan't she she'd she'll she's should shouldn't since so some somebody someone than that that'd that'll that's the thee their theirs them themself themselves then there there'd there's there've these they they'd they'll they're they've thine this those thou though through throughout thy till to toward towards under underneath until up upon us via we we'd we'll we're we've what what'd what's what've whatever when whenever where wherever which whichever while whilst who whom whose why will with within without won't would wouldn't ye yeah yes yet you you'd you'll you're you've your yours yourself I I'd I'll I'm I've

Ambiguous words:

am are aren't be being did do does doing go going had hadn't has hasn't have haven't having is isn't one past was wasn't well were

Appendix 5

Questionnaire given to students.

Is there a gene for genius?

For each statement, please circle the appropriate word to indicate whether you agree, disagree or have no opinion.

All groups:

1.	The text was easy to understand.	agree	disagree	no opinion
2.	The topic of the text was interesting.	agree	disagree	no opinion
3.	The text was worth thinking about.	agree	disagree	no opinion

Oral discussion group:

4.	The discussion helped me to understand the text.	agree	disagree	no opinion
5.	The discussion helped me to write the summary.	agree	disagree	no opinion

Reading comprehension group:

4.	a) The questions helped me to understand the text.	agree	disagree	no opinion
	b) The 'hints' helped me to answer the questions.	agree	disagree	no opinion
5.	Answering the questions helped me to write the summary.	agree	disagree	no opinion

Note-taking group:

4. Please check (✓)whether you did any of the following while reading the text:
   - __ made notes on text
   - __ highlighted or underlined words or phrases
   - __ made notes on a separate piece of paper
   - __ looked up words in a dictionary

5.	I found the summary easy to write.	agree	disagree	no opinion

All groups:

6.	I had enough time to complete the activity.	agree	disagree	no opinion

7. If you have any comments on the task you have completed, please write them below.